

WHAT IS CLAIMED IS:

Claims

1 1. A method comprising
2 mounting a sourceless orientation tracker on a user's head, and
3 using a position tracker to track a position of a first localized feature associated with a
4 limb of the user relative to the user's head.

1 2. The method of claim 1 in which the first localized feature associated with the limb
2 comprises a point on a hand-held object or a point on a hand-mounted object or a point on a
3 hand.

1 3. The method of claim 2, wherein the first localized feature is on a stylus-shaped
2 device.

1 4. The method of claim 2, wherein the first localized feature is on a ring.

1 5. The method of claim 1 further comprising using the position tracker to determine a
2 distance between the first localized feature and a second localized feature associated with the
3 user's head.

1 6. The method of claim 1 in which the position tracker comprises an acoustic
2 position tracker.

1 7. The method of claim 1 in which the position tracker comprises an electro-optical
2 system that tracks LEDs, optical sensors or reflective marks.

1 8. The method of claim 1 in which the position tracker comprises a video machine-
2 vision device that recognizes the first localized feature.

1 9. The method of claim 1 in which the position tracker comprises a magnetic tracker
2 with a magnetic source held in the hand and sensors integrated in the headset or vice versa.

1 10. The method of claim 1 in which the position tracker comprises a radio frequency
2 position locating device.

1 11. The method of claim 1 in which the sourceless orientation tracker comprises an
2 inertial sensor.

1 12. The method of claim 1 in which the sourceless orientation tracker comprises a
2 tilt-sensor.

1 13. The method of claim 1 in which the sourceless orientation tracker comprises a
2 magnetic compass sensor.

1 14. The method of claim 1 further comprising:
2 mounting a display device on the user's head; and
3 displaying a first object at a first position on the display device.

1 15. The method of claim 14 further comprising:
2 changing the orientation of the display device; and
3 after changing the orientation of the display device, redisplaying the first object at a
4 second position on the display device based on the change in orientation.

1 16. The method of claim 15, wherein the second position is determined so as to make
2 the position of the first object appear to be fixed relative to a first coordinate reference frame,
3 which frame does not rotate with the display device during said changing of the orientation
4 of the display device.

1 17. The method of claim 16, wherein the first object is displayed in response to a
2 signal from a computer.

1 18. The method of claim 17, further comprising:
2 mounting a wearable computer on the user's body, and wherein the first object is
3 displayed in response to a signal from the wearable computer.

1 19. The method of claim 15, further comprising displaying a portion of a virtual
2 environment on the display device.

1 20. The method of claim 19, further comprising:
2 displaying a portion of the virtual environment on the display device before changing
3 the orientation of the display device, and displaying a different portion of the virtual
4 environment on the display device after changing the orientation of the display device.

1 21. The method of claim 19, in which the virtual environment is a fly-through virtual
2 environment.

1 22. The method of claim 19, in which the virtual environment includes a virtual
2 treadmill.

1 23. The method of claim 15, further comprising displaying a graphical user interface
2 for a computer on the display device.

1 24. The method of claim 23, wherein the first object is a window, icon or menu in the
2 graphical user interface.

1 25. The method of claim 23, wherein the first object is a pointer for the graphical
2 user interface.

1 26. The method of claim 16, further comprising:
2 changing the position of the first localized feature relative to the position tracker; and
3 after changing the position of the first localized feature, redisplaying the first object at
4 a second position on the display device determined based on the change in the position of the
5 first localized feature.

1 27. The method of claim 26, further comprising:
2 displaying a second object on the display device, wherein

3 after changing the position of the first localized feature, the displayed position of the
4 second object on the display device does not change in response to the change in the position
5 of the first localized feature.

1 28. The method of claim 26, wherein the second position is determined so as to make
2 the position of the first object appear to coincide with the position of the first localized
3 feature as seen or felt by the user.

1 29. The method of claim 17, further comprising:
2 changing the orientation of the first coordinate reference frame in response to a signal
3 being received by the computer.

1 30. The method of claim 29, wherein the orientation of the first coordinate reference
2 frame is changed in response to a change in the position of the first localized feature.

1 31. The method of claim 29, wherein the orientation of the first coordinate reference
2 frame is changed in response to a signal representative of the location of the user.

1 32. The method of claim 29, wherein the orientation of the first coordinate reference
2 frame is changed in response to a signal representative of a destination.

1 33. The method of claim 29, wherein the orientation of the first coordinate reference
2 frame is changed in response to a signal representative of a change in the user's immediate
3 surroundings.

1 34. The method of claim 29, wherein the orientation of the first coordinate reference
2 frame is changed in response to a signal representative of a change in the physiological state
3 or physical state of the user.

1 35. The method of claim 27, wherein redisplaying the first object further comprises
2 changing the apparent size of the first object according to the change in position of the first
3 localized feature.

1 36. The method of claim 1, further comprising:
2 mounting a portable beacon, transponder or passive marker at a fixed point in the
3 environment; and

4 determining the position vector of a second localized feature associated with the
5 user's head relative to the fixed point.

1 37. The method of claim 36, further comprising determining the position vector of
2 the first localized feature relative to the fixed point.

1 38. The method of claim 36, wherein the position vector is determined without
2 determining the distance between the second localized feature and more than one fixed point
3 in the environment.

1 39. The method of claim 36, wherein the position vector is determined without
2 determining the distance between the second localized feature and more than two fixed
3 points in the environment.

1 40. The method of claim 36, further comprising:
2 mounting a sourceless orientation tracker on a second user's head; and
3 determining the position of a localized feature associated with the body of the second
4 user relative to the fixed point.

1 41. The method of claim 16, further comprising:
2 displaying the first object at a third position;
3 after displaying the first object at the third position, changing the orientation of the
4 display; and
5 after changing the orientation of the display, continuing to display the first object at
6 the third position .

1 42. The method of claim 27, wherein the first object is a window in a wraparound
2 computer interface.

1 43. The method of claim 26, wherein said changed position of the first localized
2 feature is not within the field of view of the display when the first object is redisplayed.

1 44. The method of claim 43, further comprising:
2 displaying the first object at an apparent position coinciding with the position of the
3 first localized object when the first localized object is within the field of view of the display.

1 45. The method of claim 1, further comprising:
2 positioning the first localized feature at a first point;
3 positioning the first localized feature at a second point; and
4 calculating the distance between the first point and the second point.

1 46. The method of claim 1, further comprising:
2 determining a position vector of the first localized feature relative to a second
3 localized feature associated with the user's head; and
4 transforming the position vector based on an orientation of the user's head.

1 47. The method of claim 46, further comprising:
2 setting an assumed position for the user's head in a coordinate system; and
3 setting a position for the first localized feature in the coordinate system based on the
4 assumed position of the user's head and said position vector.

1 48. The method of claim 47, where setting a position for the first localized feature
2 further comprises:
3 measuring the orientation of the user's head relative to a fixed frame of reference.

1 49. The method of claim 47, further comprising:
2 setting a virtual travel speed and direction for the user; and
3 modifying the assumed position for the user's head based on the user's virtual travel
4 speed and direction.

1 50. The method of claim 1, wherein the sourceless orientation tracker comprises a
2 first inertial sensor, and further comprising:
3 mounting a second inertial sensor elsewhere on the user's body or in an object held
4 by the user; and
5 tracking the position of one inertial sensor relative to the other.

1 51. The method of claim 14, further comprising:
2 mounting a video camera on the back of the user's head; and
3 displaying an image generated by the video camera in a portion of the display device.

1 52. A method comprising:
2 using acoustic or radio frequency signals to track a position of a first localized feature
3 associated with a limb of the user relative to the user's head.

1 53. A tracking system comprising:
2 an acoustic or radio frequency position tracker adapted for mounting on a user's head,
3 said tracker being adapted to track a position of a first localized feature associated
4 with a limb of the user relative to the user's head.

1 54. A tracking system comprising
2 a sourceless orientation tracker for mounting on a user's head, and
3 a position tracker adapted to track a position of a first localized feature associated
4 with a limb of the user relative to the user's head.

1 55. A method comprising:
2 mounting a motion tracker on a user's head;
3 using a position tracker to track a position of a first localized feature associated with a
4 limb of the user relative to the user's head;
5 positioning the first localized feature at a first point;
6 positioning the first localized feature at a second point; and
7 calculating the distance between the first point and the second point.

1 56. A system comprising:
2 mounting a first inertial sensor on a user's head;
3 mounting a second inertial sensor elsewhere on the user's body or in an object held
4 by the user; and
5 tracking the position of one inertial sensor relative to the other.

1 57. The method of claim 56, further comprising:
2 sensing data at the first and second inertial sensors and using the sensed data to track
3 the position of one inertial sensor relative to the other.

1 58. The method of claim 57, wherein tracking the position of the inertial sensor is
2 done without reference to any signal received from a source not mounted on or held by the
3 user.

1 59. The method of claim 58, wherein the drift of the relative position or orientation
2 of the second inertial sensor relative to the first inertial sensor is corrected by measurements
3 between devices on the user's head and devices elsewhere on the users body.